Space Weather Technical Forecast

Issued on Friday, 17 June 2022 at 01:09 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Daily chance of isolated M-class flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate, with AR3031 producing an isolated impulsive M1 flare at 16/0353UTC and a C4 flare at 16/1344UTC. There are currently 9 numbered sunspot regions. Regions. AR3031 remains the most significant group, currently transiting across the southwest quadrant. It is modestly large in overall size and still contains a small Delta spot in its main trailer portion, however recent imagery also shows some decay in its minor intermediate spots. All other spot groups are either unchanged in overall appearance, or showing some minor decay, and have more simplified uni-polar or bi-polar magnetic configurations.

No Earth-directed CMEs were observed in available imagery.

Solar Wind / Geomagnetic Activity: The solar wind, as measured by DSCOVR at L1, fluctuated between 520-630km/s. Density was at average levels and on a steady trend. The IMF varied weakly between 4-8nT, while the north-south component varied +/-7nT. The phi angle was predominantly positive (away from the Sun). Geomagnetic activity was largely Quiet to Unsettled (Kp 1 to 3), with an Active interval (Kp 4) 16/2100-2400 UTC.

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV) measured by GOES16 remained very slightly above Background levels, but with no solar radiation storms thresholds reached.

Electron flux (greater than 2MeV) was at Background to Moderate levels, but has risen slightly today (16th) with a peak of 461 pfu at 16/1940 UTC. Corresponding 24-hour integrated electron fluence has been well below the Active (1e8 integrated pfu) threshold, although is now showing a rising trend. 9.2e6 integrated pfu was observed at 17/0000UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Barring new development, solar activity is expected to continue mostly Low, but with a chance of further isolated M-class flares, most likely from AR3031.

Solar Wind / Geomagnetic Activity: No CMEs are currently expected to affect Earth during the period.

Solar winds are expected to remain mostly elevated through much of the next few days, due to influence from coronal holes 90 then 92. By Day 4 (20th) solar winds should decline as these features rotate away from a geo-effective position.

Geomagnetic activity is expected to fluctuate in the range Quiet to Active for the first half of the period, with a just very Slight Chance of a G1/Minor Storm interval, before becoming largely

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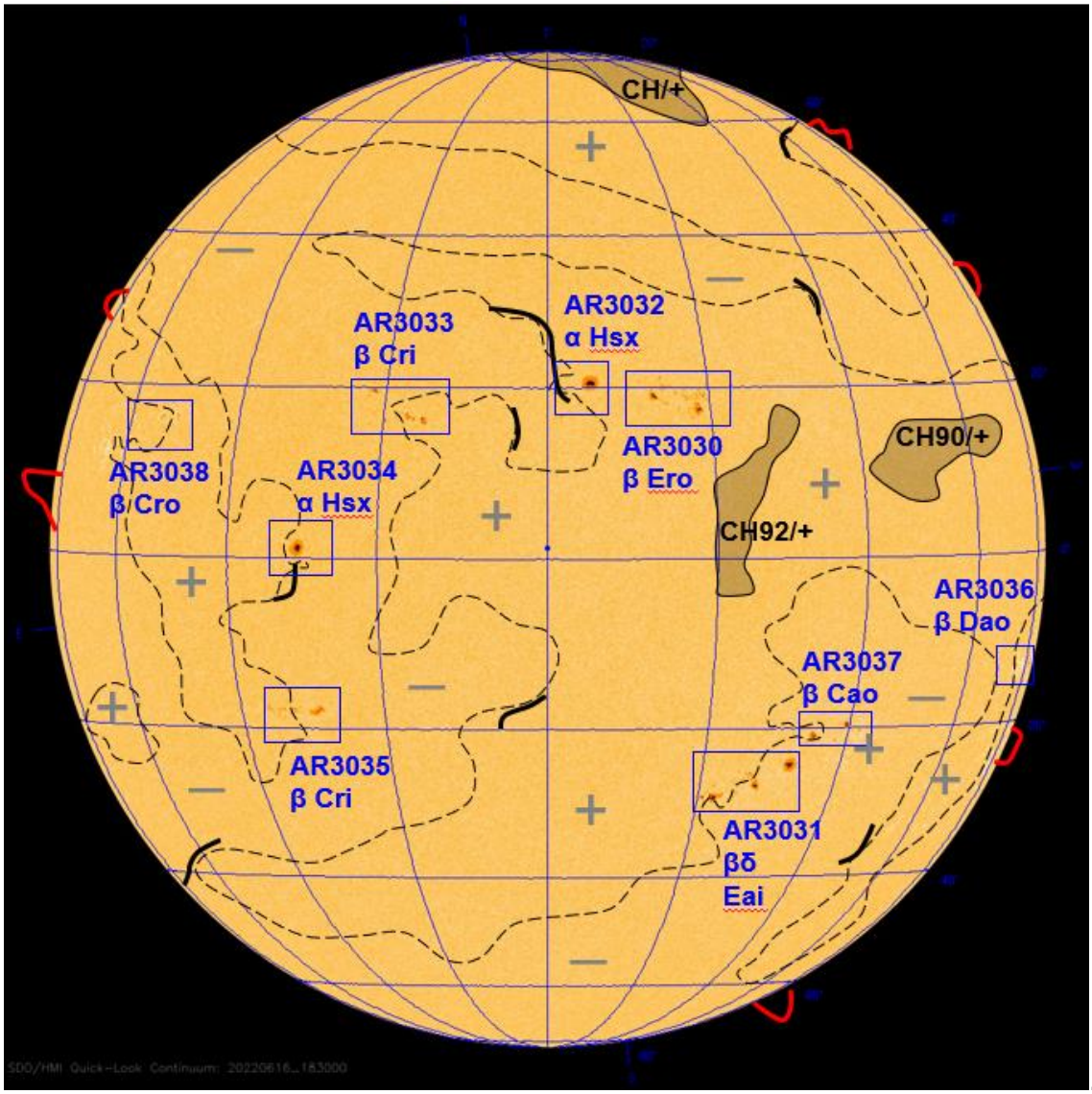
Quiet by Day 4 (20th).

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10 MeV) is expected to be very near Background during the period, with a daily Slight Chance of an S1 or greater event occurring.

High energy electron flux (greater than 2 MeV) is expected to start at Background to Moderate levels, but with a chance of increasing to High levels due to high speed stream influences. Electron fluence is expected to follow a gradual rising trend, with a peak chance of reaching Active (1e8 integrated pfu) levels by Day 3 (19th).

Figure 1. Solar Analysis Valid 16/1900 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

No CMEs are currently expected to affect Earth during the period.
Solar winds are expected to remain mostly elevated through much of the next few days, due to influence from coronal holes 90 then 92. By Day 4 (20th) solar winds should decline as these features rotate away from a geo-effective position.

Geomagnetic activity is expected to fluctuate in the range Quiet to Active for the first half of the period, with a just very Slight Chance of a G1/Minor Storm interval, before becoming largely Quiet by Day 4 (20th).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	5	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

None expected.

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Radio Blackouts - X-Ray Flares:

There are currently 9 numbered sunspot regions. AR3031 remains the most significant group, currently transiting across the southwest quadrant. It is modestly large in overall size and still contains a small Delta spot in its main trailer portion, however recent imagery also shows some decay in its minor intermediate spots. All other spot groups are either unchanged in overall appearance, or showing some minor decay, and have more simplified uni-polar or bi-polar magnetic configurations.

The balance of sunspot groups on the front side should remain largely unchanged in this period, with only apparently fading AR3036 leaving the disc, and with no obvious bright EUV regions evident on STEREO A EUVI imagery at present.
Barring new development, solar activity is expected to continue mostly Low, but with a chance of further isolated M-class flares, most likely from AR3031.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	30	30	30	30
Very Active	R3 to R5 X Class	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) remains very slightly elevated, albeit well below S1 in a damped and delayed response in the wake of the 13 June M3 flare.
There is a slight chance of an S1 or greater event in the period as a result of the westward transit of AR3031, which is the most likely spot group of the current cohort to produce a significant flare, and is now rotating into better Earth connected longitudes.

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	10	10	10	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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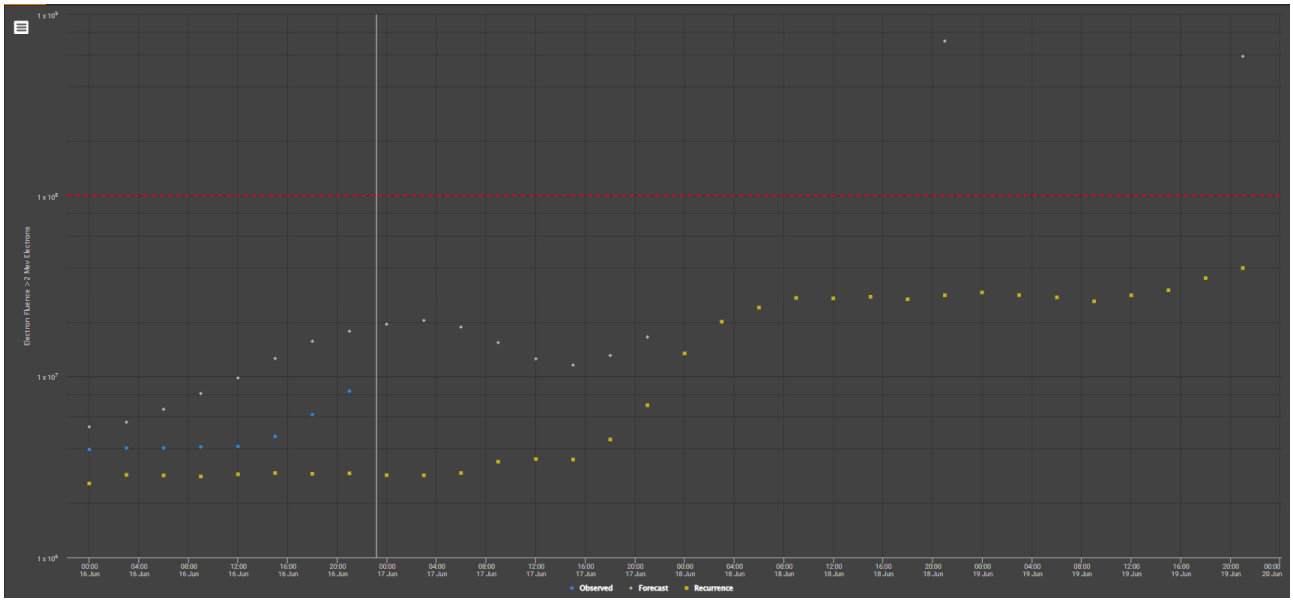
High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2MeV) as observed by GOES16 is currently at Background to Moderate levels, but has risen slightly today (16th) with a peak of 461 pfu at 16/1940 UTC. A further rising trend is likely in the coming few days under coronal hole high speed stream influences, with diurnal flux probably peaking into High levels.

The corresponding electron fluence is now expected to follow a gradual rising trend, with a chance of reaching or exceeding the Active (1e8 integrated pfu) threshold, perhaps most likely on Day 3 (19th). REFM output is considered to be a significant over-estimate on Days 2 and 3 (18th and 19th), with recurrence offering a more likely trend and suggesting marginal chance of Active fluence.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	10	30	50	40
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 2: MOSWOC REFM



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